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*Scientific
Intelligence
Report*

**Assessment of New HEN HOUSE Facilities
in the USSR**

Declass Review by NIMA/DOD

OSI-SR []
28 August 1964



Office of Scientific Intelligence

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Scientific Intelligence Report

**ASSESSMENT OF NEW HEN HOUSE
FACILITIES IN THE USSR**

OSI-SR/ [REDACTED]

28 August 1964

**CENTRAL INTELLIGENCE AGENCY
Office of Scientific Intelligence**

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ASSESSMENT OF NEW HEN HOUSE FACILITIES IN THE USSR

PROBLEM

To make a preliminary determination of the purposes of the HEN HOUSE facilities presently being constructed at Sary Shagan Site 13, Angarsk, and Olenegorsk.

SUMMARY AND CONCLUSIONS

1. Sixteen new HEN HOUSE antennas are under construction in the USSR; two at Olenegorsk, eight at Angarsk, and six at Sary Shagan. These facilities could be completed by the end of 1965 or early 1966.
2. The Olenegorsk facility is probably a part of a ballistic missile early warning facility and could also be used as part of a satellite tracking net. If a ballistic missile early warning net is contemplated by the USSR, several additional installations will be required on the northern periphery.
3. The Sary Shagan and Angarsk facilities are probably for satellite tracking and may comprise the total satellite tracking net. However, the Olenegorsk facility could supplement the other two facilities in a satellite tracking role, and/or additional facilities could be built elsewhere.
4. The new installations at Angarsk and Sary Shagan, when completed, will represent a capability considerably in excess of that required merely to detect the passage of U.S. space vehicles. The USSR already has a capability to track its own satellites, utilizing transmissions from them, with greater accuracy than would be provided by the new system. These factors, when coupled with the estimated technical characteristics of the new system, suggest that the Soviets are proceeding with the construction of an anti-satellite system. Present evidence, however, does not permit a firm judgment regarding Soviet intent to employ such a system, and it should be pointed out that a nuclear warhead would probably be required on the interceptor missile.

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5. No anti-satellite launch facilities have been identified to date, but interceptor missiles could be launched from one of the test ranges or from an operational ballistic missile site with little or no advance indication.

DISCUSSION

BACKGROUND

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The HEN HOUSE and HEN ROOST radars at Sary Shagan were first photographed [REDACTED]

[REDACTED] Satellite photography subsequent to [REDACTED] indicated the initiation of construction of sixteen additional HEN HOUSE-type radar installations at three locations in the USSR. To date, none of these installations has been completed. Search is continuing to ascertain if additional HEN HOUSEs are being constructed at other locations.

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DESCRIPTION OF HEN HOUSE RADAR

The original HEN HOUSE radar at Sary Shagan is housed in a very large structure nearly 900 feet long and more than 60 feet high. (See Figures 1 and 2.) The antenna's face is oriented on [REDACTED] degrees, toward the Kapustin Yar Missile Test Rangehead. The antenna's aperture is more than 800 feet long, 50 feet high, and is inclined at an angle of 25 degrees from the vertical. At one end of the antenna building, there is a large 450 by 60 foot building which probably contains the high-powered transmitters and control equipment. On the basis of this configuration, HEN HOUSE is believed to be a high-power, comparatively low frequency radar which scans electronically. The new installations under construction resemble the original HEN HOUSE except that they are being built in pairs with two 900-foot antenna buildings, one on each side of the probable transmitter building.

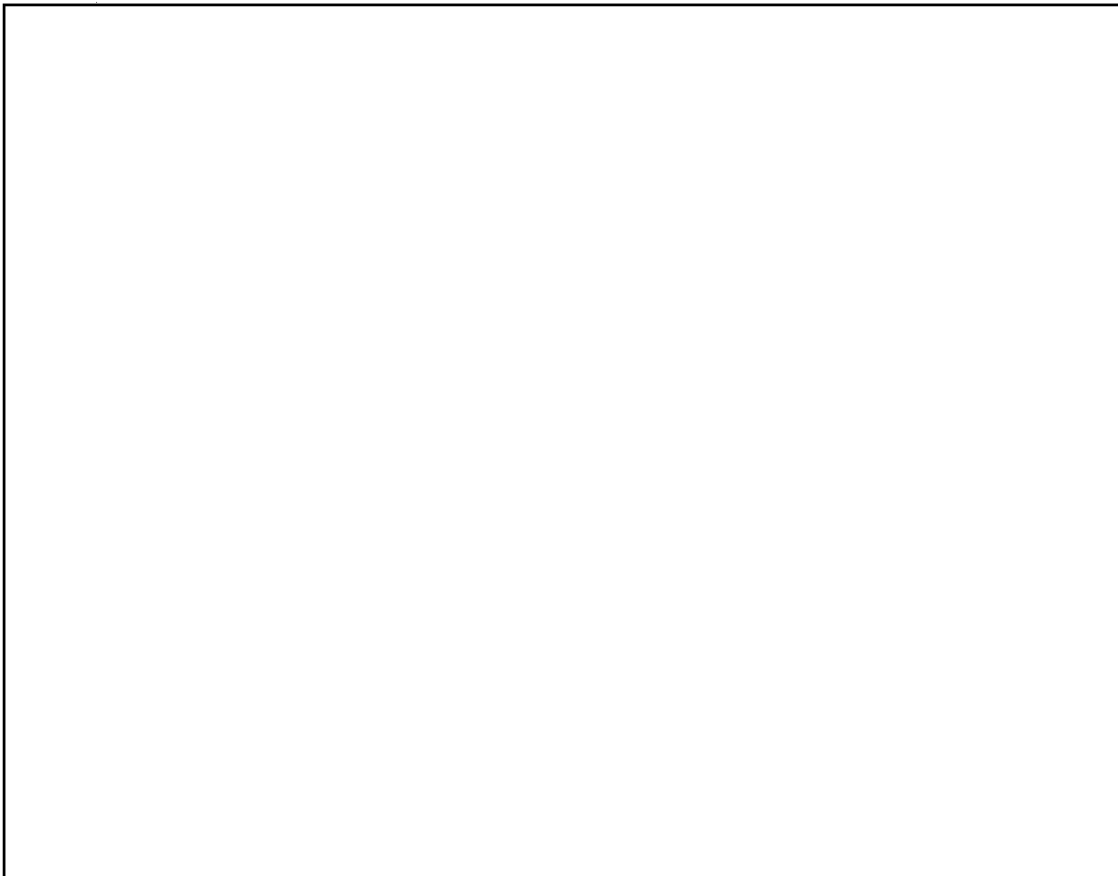
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DEPLOYMENT

The deployment of the 17 HEN HOUSE radars is shown in Figure 3. There are eight pairs of HEN HOUSE radars under construction, plus the original single HEN HOUSE at Sary Shagan. We believe that

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both antennas in a pair of HEN HOUSEs look in the same direction rather than in reciprocal directions. This is based on site geometry and the undesirability of having high-powered radars transmit toward other facilities in close proximity to them. With each of two pairs covering the same general azimuth, it will be possible to obtain increased elevation coverage, and thereby reducing the overhead "dead zone."

The deployment of the HEN HOUSE installations falls into two families, with one group (three pairs at Sary Shagan and four pairs at Angarsk) looking generally east-west and the other, a single pair at Olenegorsk, looking north. (See Figure 4.)

ANTI-ICBM CAPABILITY

The canted pair of antennas at Olenegorsk which looks northwest toward the U.S. probably will provide an early warning capability and good trajectory prediction for most of the missiles fired toward Moscow from the U.S.; Polaris missiles launched within its arc of coverage could also be tracked, but with less warning time and probably with reduced prediction accuracy depending upon the trajectory utilized. In order to provide early warning of U.S.-launched ICBM's for other than the general Moscow area, several additional installations would be required on the northern periphery.

Based on a simulated Minuteman trajectory from Montana, the Olenegorsk installation should be able to acquire the ICBM 18 minutes prior to impact in the Moscow area. After eight minutes of tracking (ten minutes prior to impact), the system could predict the subsequent impact position of the missile to within an ellipse measuring 0.4 n.m. by 1.2 n.m. The Olenegorsk system could also have a capability to back-track the ICBM trajectory to an elliptical area measuring approximately one by seven nautical miles and thus give an indication of the launch complex used.

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One major problem of an ICBM detection and tracking system operating at such low frequencies [REDACTED] is nuclear blackout. The Olenegorsk site would not be affected by nuclear bursts in the target area well to its rear, but would of course remain vulnerable to a precursor burst positioned ahead of the site, or, because of the

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lack of ABM defenses near the site, would itself be vulnerable to nuclear attack.

A significant advantage of the low radar frequencies used is the relatively large radar cross-section of re-entry vehicles at these frequencies and the improved capability to discriminate against small decoys.

We estimate that the Olenegorsk installation could be completed in the latter half of 1965. This installation would significantly improve the capabilities of any ABM defenses for the Moscow area.

ANTI-SATELLITE CAPABILITY

This initial analysis of the HEN HOUSE installations in an anti-satellite role is based on simulated tracking from all three locations, Sary Shagan, Olenegorsk, and Angarsk. A satellite vehicle in an orbit with 88 degrees inclination and at a constant altitude of 100 nautical miles was chosen for the analysis. Elevations of up to 52 degrees were used where two pairs of HEN HOUSEs were available, and elevations of up to 26 degrees were considered where only a single pair was available. The radar capabilities discussed above were the basis for the computations. The computations indicated that the ± 2 degrees elevation accuracy assumption did not produce significantly more accurate results than an accuracy of ± 20 degrees in elevation as long as the assumption that doppler data accurate to ± 10 fps was utilized. Thus the ± 2 degrees assumption was not critical to the analysis.

The computations showed that at the end of six orbits after launch, the system could predict the position of the satellite in the seventh orbit with a major-axis error of less than 900 feet. If the prediction were extended as far ahead as the sixteenth orbit, the error, without further tracking, would still be less than 8,000 feet. Such prediction accuracies would permit the launching of an interceptor vehicle to a predicted point in an attempt to destroy the satellite. However, even the 900-foot accuracy probably would require use of a nuclear warhead on the interceptor missile.

We believe that all of the HEN HOUSE installations identified to date at Sary Shagan and Angarsk could be completed by the end of 1965 or early 1966. We have no indication as yet as to whether ad-

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ditional installations will be constructed to extend the east-west, Sary Shagan-Angarsk, net. We believe that this net is almost certainly for satellite detection and tracking and that the Olenegorsk site would also support it. The Moscow "A frame" installation might also provide data to such a system. However, considering the orientation and location of the Sary Shagan-Angarsk HEN HOUSE facilities, they do not appear to have any significant role in anti-ballistic missile defense.

The information on the HEN HOUSE radar is too limited to make a firm estimate of the cost of an individual element or of the total system. It is estimated that the total cost of the 16 HEN HOUSE radars presently under construction might run from 100 to 160 million dollars but this does not include support facilities, housing, etc., which may prove to be a significant factor. If the HEN HOUSE radars are more complex internally than presently estimated, this cost could also be considerably higher.*

We feel it unlikely that the USSR would expend such resources only for the purpose of detecting the passage of U.S. space vehicles, or of locating "space garbage" in general. Such a minimum system would cost approximately 25 million dollars. Furthermore, the USSR already has a capability to track its own satellites, using co-operating S-band beacons, with greater accuracy that would be provided by the new system. These factors suggest that the Soviets are proceeding with the construction of an anti-satellite system. Current evidence does not provide the basis for a firm conclusion as to the Soviet intent to extend this development, or to employ it in an anti-satellite role once it is finished. The Soviet concern over Western reconnaissance has been continually stressed, however, and adds weight to the possibility that the HEN HOUSE system has an anti-satellite role.

We have not yet identified any launch facilities that would be used in the system nor have we noted any research and development testing indicative of a satellite intercept system. If existent ballistic missiles were to be used as the interceptor vehicle, launch facilities at the missile test ranges or at operational sites could perform this function. With the amount of "space garbage" now avail-

*This section on the estimated cost of the HEN HOUSE installations was provided by the Office of Research and Reports.

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Figure 1



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Sary Shagan Missile Test Center: Original HEN HOUSE

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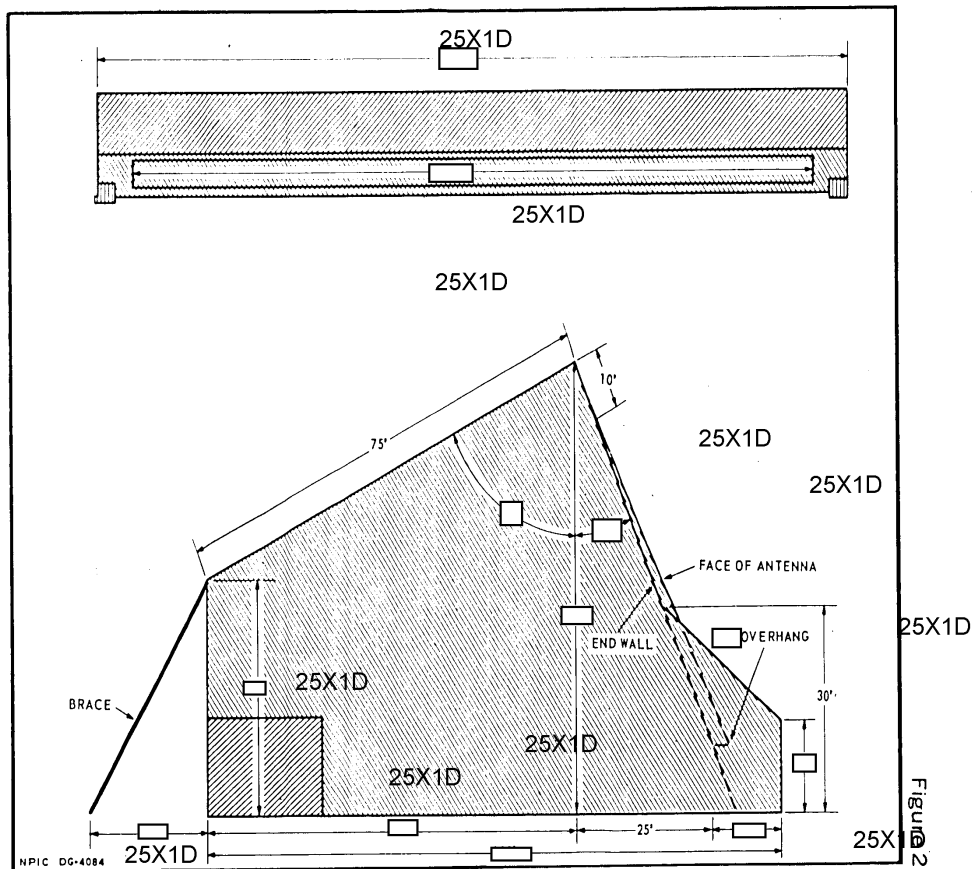
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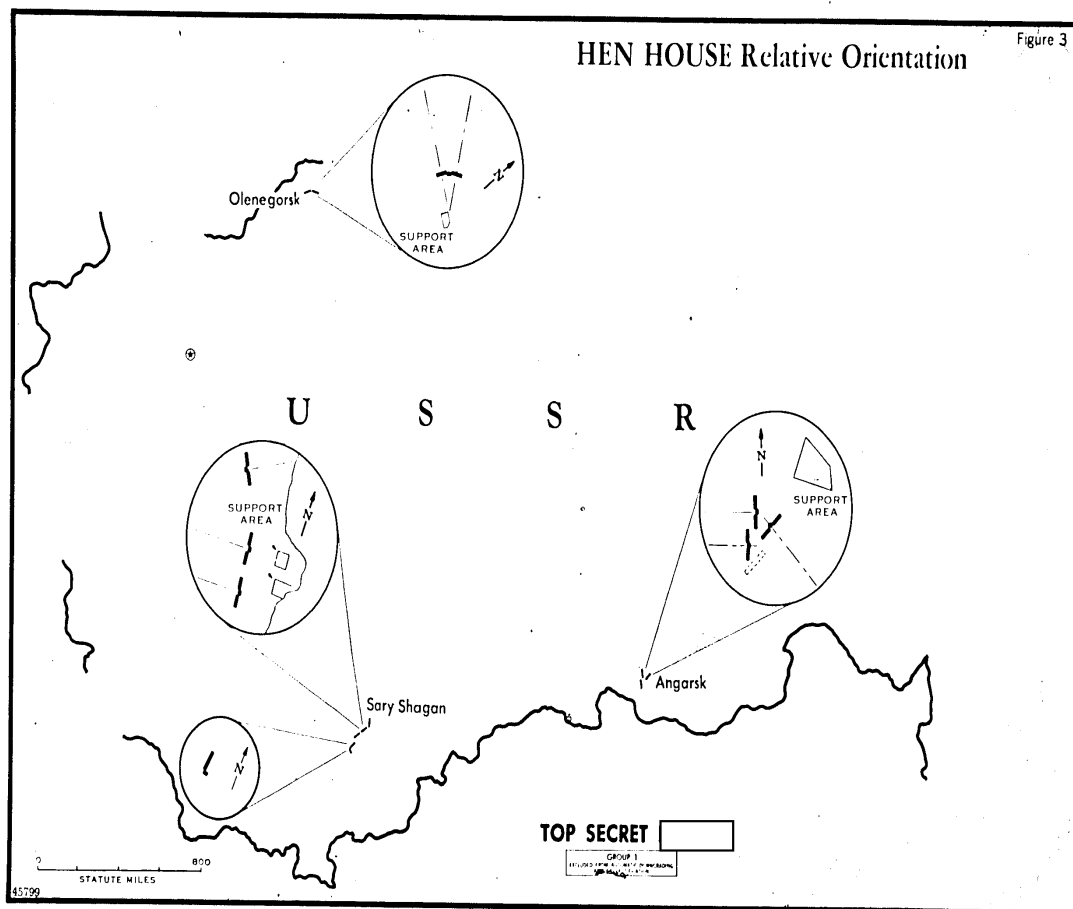
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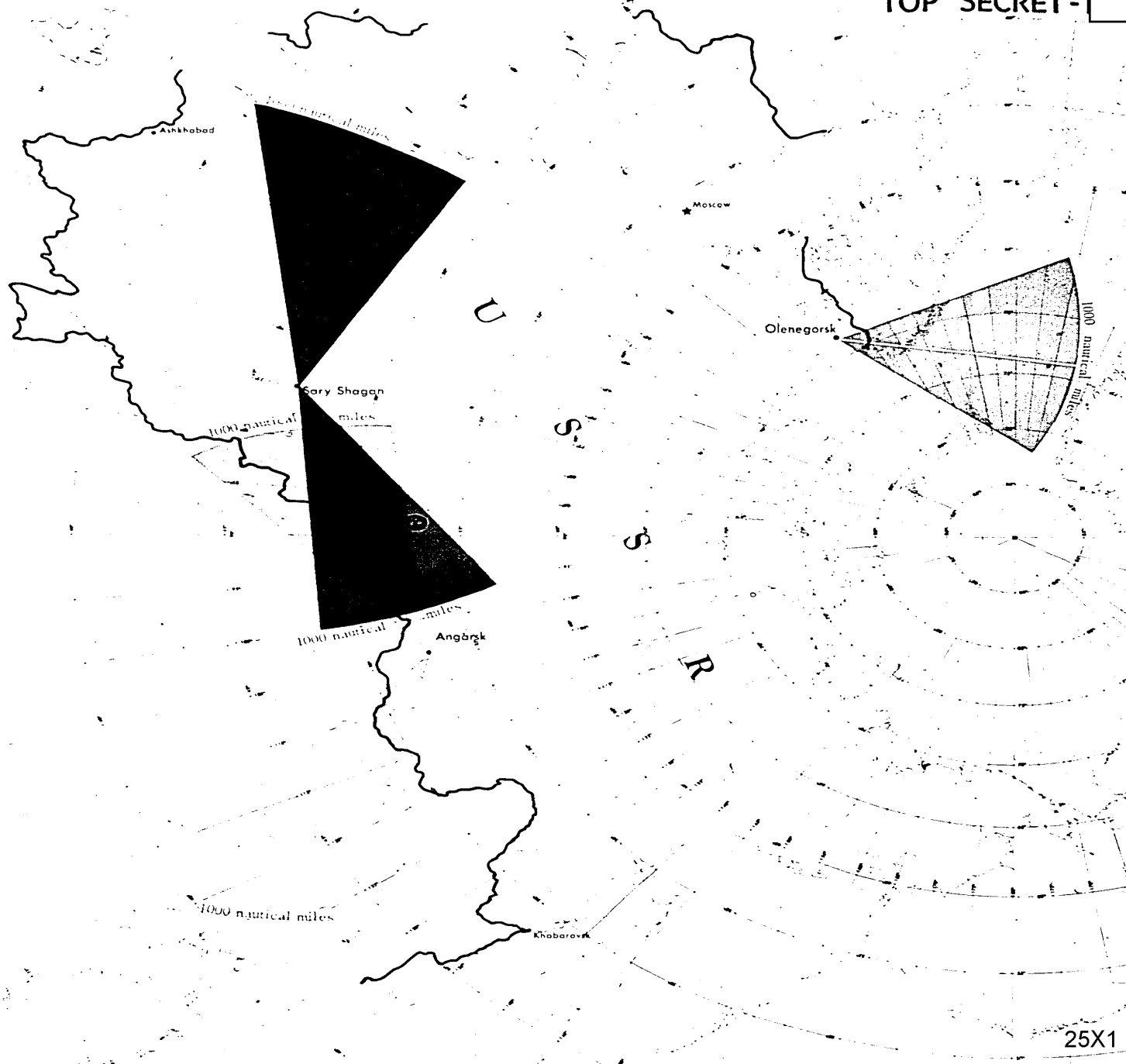
Sary Shagan Missile Test Center: Plan and Elevation Views of Original HENHOUSE

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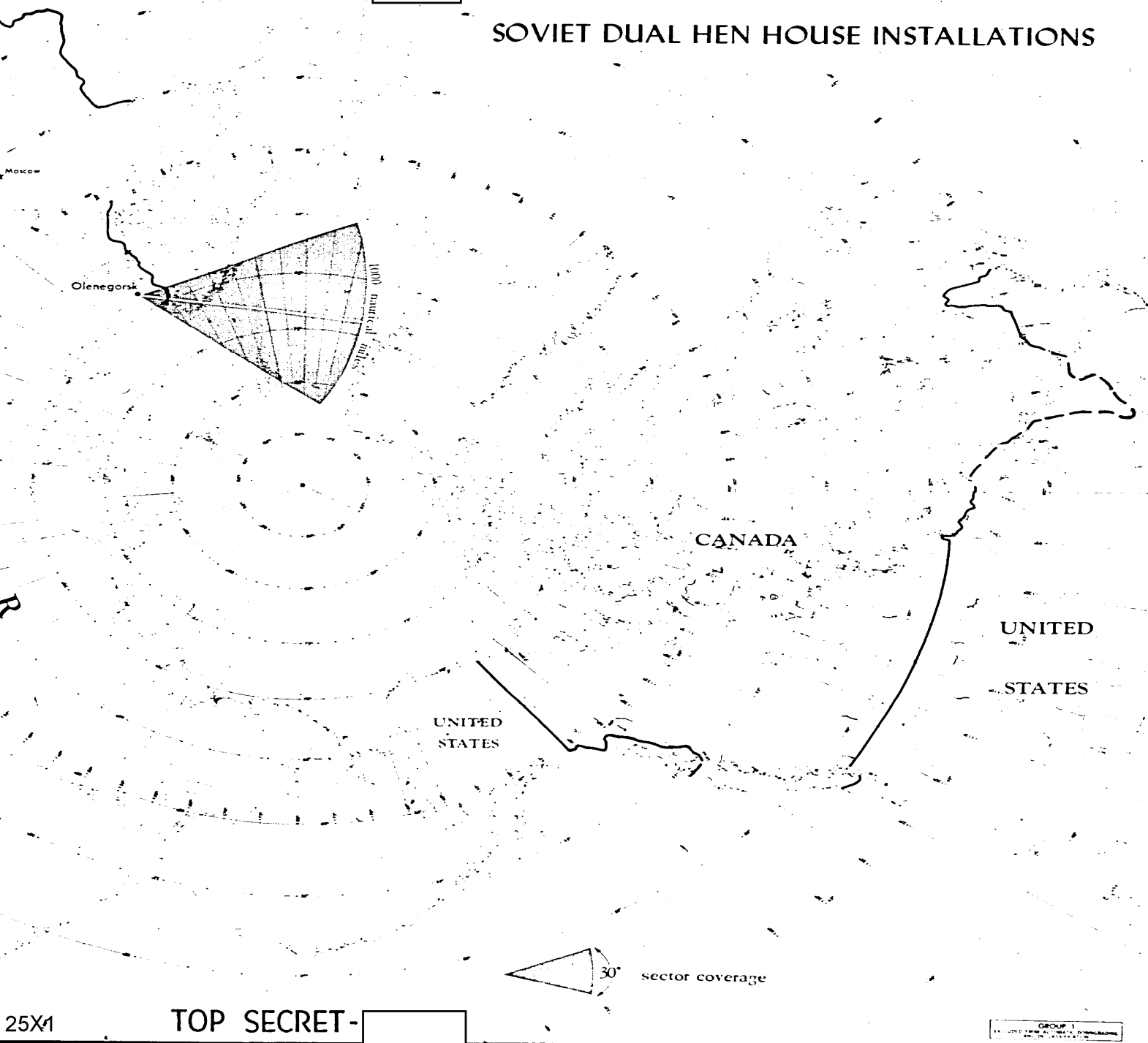


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able as targets for development testing, we might or might not identify such test firings if they occur as apparently routine launchings of ballistic missiles from Kapustin Yar or Tyuratam. Neither is it yet clear whether any of the anti-missile missiles of the ABM systems under development in the USSR are capable of utilization in an anti-satellite role.

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